

WHAT IS CLAIMED IS:

1. A formable thermoplastic multi-layer laminate comprising

an outer layer comprising a polymer comprising resorcinol arylate polyester chain members,

a middle layer comprising a thermoplastic polymer,

an inner-tie layer comprising a thermoplastic polymer comprising a carbonate polymer and an acrylonitrile-styrene graft copolymer comprising at least one of an acrylonitrile-styrene-acrylate graft copolymer (ASA) or an acrylonitrile-butadiene-styrene graft copolymer (ABS),

the middle layer being between the outer layer and the inner-tie layer and being in contact with both the outer layer and the inner-tie layer.

2. The multi-layer laminate of claim 1 wherein the acrylonitrile-styrene graft copolymer comprises at least one of an acrylonitrile-styrene-acrylate graft copolymer (ASA) or an acrylonitrile-butadiene-styrene graft copolymer (ABS).

3. The multi-layer laminate of claim 1 wherein the acrylonitrile-styrene graft copolymer further comprises a styrene copolymer.

4. The multi-layer laminate of claim 3 wherein the styrene copolymer is a styrene acrylonitrile copolymer (SAN).

5. The multi-layer laminate of claim 1 wherein the acrylonitrile-styrene graft copolymer comprises an acrylonitrile-styrene-acrylate graft copolymer (ASA).

6. The multi-layer laminate of claim 5 wherein the acrylonitrile-styrene-acrylate graft copolymer (ASA) further comprises a styrene acrylonitrile copolymer (SAN).

7. The multi-layer laminate of claim 1 wherein the acrylonitrile-styrene graft copolymer comprises an acrylonitrile-butadiene-styrene graft copolymer (ABS).

8. The multi-layer laminate of claim 1, wherein the inner-tie layer comprises about 25 to about 80 wt.% polycarbonate based on the total weight of the inner-tie layer.

9. The formed article of claim 3 wherein the inner-tie layer comprises a thermoplastic polymer comprising from about 25 to about 80 weight % of carbonate polymer, from about 10 to about 35 weight % of the acrylonitrile-styrene graft copolymer and from about 10 to about 40 weight % of the styrene copolymer, the weight % being based on the total weight of the inner-tie layer.

10. The multi-layer laminate of claim 9 wherein the inner-tie layer comprises a thermoplastic polymer comprising from about 40 to about 80 weight % carbonate polymer, from about 10 to about 30 weight % of the acrylonitrile-styrene graft copolymer and from about 10 to 30 weight % of the styrene copolymer, based on the total weight of the inner-tie layer.

11. The multi-layer laminate of claim 1 wherein the inner-tie layer further comprises a stabilizer comprising an alkylthioester.

12. The multi-layer laminate of claim 11 wherein the inner-tie layer further comprises a stabilizer comprising pentaerythritol.tetrakis(beta-laurylthiopropionate).

13. The multi-layer laminate of claim 7 wherein the inner-tie layer further comprises a stabilizer comprising pentaerythritol .

14. The multi-layer laminate of claim 1 wherein the inner-tie layer comprises a thermoplastic polymer having a melt flow index of from about 3 to about 30 cm³/10min (at 260°C/5kg).

15. The multi-layer laminate of claim 1 wherein the outer layer has an outermost surface comprised of at least one sub-layer comprising resorcinol arylate polyester chain members.

16. The multi-layer laminate of Claim 15, wherein the at least one sub-layer comprises an iso-terephthalic resorcinol/bis-phenol-A copolymer.

17. The multi-layer laminate of claim 15 wherein the outer layer further comprises at least one additional sublayer.

18. The multi-layer laminate of claim 17 wherein the outer layer consists of at least three additional sub-layers.

19. The multi-layer laminate of claim 1 wherein the middle layer comprises a polycarbonate.

20. The multi-layer laminate of claim 19 wherein the polycarbonate comprises a poly alkylacrylate.

21. The multi-layer laminate of claim 20 wherein the poly alkylacrylate comprises poly methyl methacrylate.

22. The multi-layer laminate of claim 1 formed by the co-extrusion of the inner-tie layer, middle layer and outer layer.

23. The multi-layer laminate of claim 1 wherein the outer layer has a thickness about 3 to about 30 mils.

24. A formed multi-layer laminate comprising the multi-layer laminate of claim 1 formed by a forming method that is at least one of thermoforming, compression forming.

25. The formed multi-layer laminate of claim 24 formed by thermoforming.

26. The formed multi-layer laminate of claim 24 formed by compression forming.

27. The formed multi-layer laminate of claim 25 wherein the formed multi-layer laminate is formed by vacuum forming.

28. An article comprising

a formable thermoplastic multi-layer laminate comprising

an outer layer comprising a polymer comprising resorcinol arylate polyester chain members,

a middle layer comprising a thermoplastic polymer,

an inner-tie layer comprising a thermoplastic polymer comprising a carbonate polymer and an acrylonitrile-styrene graft copolymer comprising at least one of an acrylonitrile-styrene-acrylate graft copolymer (ASA) or an acrylonitrile-butadiene-styrene graft copolymer (ABS),

the middle layer being juxtaposed between the outer layer and the inner-tie layer and being in continuous contact with both the outer layer and the inner-tie layer, and

a substrate bonded to the inner-tie layer.

29. The formed article of claim 28 wherein the substrate is at least one of a thermosetting material, a thermoplastic material, a foamed material, a plastic, a reinforced thermoplastic material, and combinations thereof.

30. The article of claim 28 wherein the substrate comprises a foamed material.

31. The article of claim 29 wherein the foamed material comprises a foamed polyurethane material.

32. The article of claim 28 wherein the substrate comprises a thermoplastic polyurethane.

33. The article of claim 32 wherein the thermoplastic polyurethane further comprises reinforcing fibers.

34. The article of claim 33 wherein the reinforcing fibers are glass fibers.

35. The article of claim 33 wherein the reinforcing fibers are carbon fibers.
36. The article of claim 28 that is at least one of an exterior automotive panel.
37. The article of claim 36 that is at least one of a door panel, a hood panel, or a roof panel.
38. The article of claim 28 wherein the multi-layer laminate is a formed multi-layer laminate.
39. The article of claim 28 comprising an exterior surface having a class "A" finish.
40. A method of making an article, comprising
- providing a multi-layer laminate comprising
- an outer layer comprising a polymer comprising resorcinol arylate polyester chain members,
- a middle layer comprising a thermoplastic polymer, and
- an inner-tie layer comprising a thermoplastic polymer comprising a carbonate polymer and an acrylonitrile-styrene graft copolymer comprising at least one of an acrylonitrile-styrene-acrylate graft copolymer (ASA) or an acrylonitrile-butadiene-styrene graft copolymer (ABS),
- the middle layer being between the outer layer and the inner-tie layer and being in contact with both the outer layer and the inner-tie layer;
- placing the multi-layer laminate into a mold so that a cavity is formed behind the multi-layer laminate; and
- placing a substrate into the cavity behind the multi-layer laminate wherein the inner-tie layer of the multi-layer laminate bonds to the substrate to provide an article.

41. The method of claim 40 further comprising forming the multi-layer laminate into a formed multi-layer laminate before it is placed into the mold.

42. The method of claim 41 wherein the mold comprises a shape or cavity that substantially conforms to the formed multi-layer laminate.

43. The method of claim 40 further comprises cooling the article.

44. The method of claim 40 further comprising removing the article from the mold.

45. The method of claim 40 wherein the substrate is injected into the cavity.

46. The method of claim 45 wherein the substrate formed by reaction injection molding.